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Paper No. 15

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

MAILED

SEP. 10 2002

Ex parte ZHIDAN LI TOLT,
ZVI YANIV
and RICHARD LEE FINK

**PAT. & T.M. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES**

Appeal No. 2000-0992
Application No. 08/859,960

ON BRIEF

Before LIEBERMAN, PAWLIKOWSKI and NAGUMO, Administrative Patent
Judges.

PAWLIKOWSKI, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the final rejection of
claims 1-26, which are all the claims pending in the application.

The subject matter on appeal is represented by claims 1, 9,
11, and 12, set forth below:

1. A method for making a field emitter device comprising the steps of:

providing a substrate;

treating said substrate to modify a morphology of said substrate; and

growing a carbon film on said treated substrate.

9. The method as recited in claim 1, further comprising the step of performing sonication on said substrate.

11. The method as recited in claim 1, further comprising the steps of:

depositing a metal layer on said substrate whereby said metal layer has a predefined pattern so that a portion of said substrate is accessible through said metal layer, wherein said depositing step is performed before said growing step.

12. The method as recited in claim 11, wherein said step of growing said carbon film also deposits said carbon film on said metal layer, wherein said carbon film is a continuous film.

We note that claims 14, 15, and 16 are directed to a device.

The references relied upon by the examiner as evidence of unpatentability are:

Song et al. (Song)	5,696,385	Dec. 9, 1997
Yoshioka et al. (Yoshioka)	5,759,080	June 2, 1998

Claims 1-3, 10-12, 14-19 and 26 stand rejected under 35 U.S.C. § 103 as being unpatentable over Song.

Claims 4-9, 13, and 20-25 stand rejected under 35 U.S.C. 103 as being unpatentable over Song in view of Yoshioka.

OPINION

For the reasons set forth in the brief, and in the reply brief, and below, we reverse each of the above-noted rejections.

I. The 35 U.S.C. § 103 rejection of claims 1-3, 10-12, 14-19 and 26 over Song

Although the examiner rejected claims 1-3, 10-12, 14-19, and 26 under 35 U.S.C. § 103, the examiner relies upon the theory of inherency to meet the aspect of claim 1 regarding the phrase "treating said substrate to modify a morphology of said substrate". (answer, pages 4-5).

We note that when a examiner relies upon a theory of inherency, "the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (BPAI 1990). Inherency "may not be established by a probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." Ex parte Skinner, 2 USPQ2d 1788, 1789 (BPAI 1986). Also, the examiner has the initial burden of providing such evidence or technical reasoning. See In re Spada, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990); In re King, 801 F.2d 1324, 1327, 231 USPQ 136, 138-39 (Fed. Cir. 1986).

Here, the examiner has not met this burden for the following reasons.

a. *Claim Interpretation*

We first determine the meaning and scope of claim 1 in light of appellants' specification. This determination is set forth below.

Claim 1 recites the following steps:

- 1) providing a substrate;
- 2) treating said substrate to modify a morphology of said substrate; and
- 3) growing a carbon film on said treated substrate.

With respect to step 1), we find that the specification provides that the word "substrate" is used narrowly, as being the original or modified substrate, i.e., with no substantial layers on top of it. See Figures 1-5 and Figures 7 and 10, and the description of these figures found on pages 6-9 and 10 of appellants' specification.

With respect to step 2), Appellants' specification provides the following disclosure.

Page 3 of the specification discloses that a treating step on the substrate is conducted so that a patterned cathode is produced without processing the emission film. (specification, page 3, lines 1-6). After the treating step, then a film is deposited or grown on the substrate. (specification, page 3, lines 9-10 and lines 21-22).

The treatment of the substrate changes the micro-morphology of the substrate (i.e., it "roughens" the surface of the substrate) **thus providing a preferential surface for the film to be grown.**[emphasis added] (page 4, lines 1-5). A sonication process on the treated substrate may be employed to further enhance the growth of the film on the substrate. (specification,

page 4, lines 6-8). **The advantage achieved is that a film grown on the treated portion of the substrate is a better electron emitter material than the film grown on the untreated portion of the substrate.** [emphasis added] (specification, page 4, lines 11-15).

Figures 2-4 of appellants' specification illustrate the manner in which metal layer 102 is patterned and etched. The etchant used to remove metal layer 102 also attacks substrate 101. Because substrate 101 is not perfectly uniform, the etchant attacks some areas of substrate 101 more than other areas. This leaves the surface of the substrate 101 pitted and rough. Surface treatments by acids and bases may also change the chemical composition of the substrate surface as well as change the morphology. For example, certain treatments may leave the surface of the substrate terminated with bonds to hydrogen or fluorine atoms. If the substrate is a composition of different materials, the treatment may result in leaving the surface with a different composition than the bulk material of the substrate. Because the CVD growth process often involves chemical reactions with the substrate surface, treatments that change the chemical composition of the substrate may result in **a surface that initiates film growth more favorably than an untreated surface.** [emphasis added] (specification, page 7, lines 6-22 and page 8, lines 1-2).

Hence, with respect to step 2), we find that the specification provides that the phrase, "treating the substrate to modify the morphology", is a treatment that results in a more favorable growth of the deposited carbon film on treated areas of the substrate than on untreated areas.

With respect to step 3), growing a carbon film on said treated substrate, we find that the specification requires the absence of any intervening layers between the treated substrate and the carbon film, and we refer to all of the aforementioned cites to the specification in support of this interpretation.

b. Analysis

Turning now to appellants' position, appellants state that "[t]hough Song may perform an etching step to pattern metal layer 330 on substrate 310, nothing in Song teaches or suggests that such an etching step either (1) modifies a morphology, (2) changes the chemical composition of the surface of the substrate, or (3) roughens the surface of the substrate". (brief, page 4).

Appellants' aforementioned interpretation of Song is in connection with Figures 14 and 15 because Figures 14 and 15 of Song includes pattern metal layer 330 on substrate 310. Upon our review of the description of Figures 14 and 15 found at the bottom of column 4 and at the top of column 5 of Song, we find the appellants' statement concerning an etching step refers to the formation of the emission well 360 shown in Figure 15. Emission well 360 is formed by selectively etching portions of conductive layer 351 (shown in Figure 14), dielectric layer 341, and field shaper layer 377, thereby forming a row conductor 350, a dielectric layer 340, and a field shaper 37, as shown in Figure 15. See column 5, lines 1-7 of Song. We find that this disclosure does not indicate that substrate 310 is etched.

Furthermore, we cannot find disclosure indicating that the substrate shown in Figure 2, or the substrate shown in Figures 4-8 is etched. For example, Figure 2 shows that metal columns 230 are formed on substrate 210. However, column 3, lines 1-15

does not disclose how metal columns are formed on substrate 210, so we are unable to determine that in fact substrate 210 was etched when metal columns 230 were formed.

In view of the above, we find that there is no disclosure of a treatment of the substrate (or even of ballast layer 265) that would necessarily "modify the morphology" of the substrate, as required by step 2 of the claimed process.¹

Furthermore, upon our review of the examiner's presentation of this rejection made on page 3 of the answer, we find that the examiner does not point to any specific disclosure of Song that shows that any of the substrates in the Figures are etched. On page 4 of the answer, the examiner states, "the prior art etches and patterns in the manner which is encompassed by the instant specification." However, the examiner does not point to any specific disclosure in Song supporting this conclusion.

On page 5 of the answer, the examiner states "the change in the substrate would in fact propagate to the ballast material and thus effect the carbon emitter". Yet, the examiner does not support this conclusion with facts in the record.

Furthermore, upon comparing the disclosure of Song with the properly interpreted claims, it is clear that Song does not

¹ At col. 4, ll. 1-9, Song teaches that the ballast layer may be amorphous silicon doped by ion-implantation of boron at 30 keV. The examiner did not identify this teaching, and there is no prominent teaching in the record indicating that this treatment meets the limitation of step 2. This issue could be pursued if either appellants or the examiner supplements the record with relevant evidence.

disclose step 3 of growing a carbon film on the treated substrate. In Song's figures, there is always a ballast layer between the substrate and the carbon layer.²

To the extent the examiner has attempted to reject product claims 14-16 on the basis that Song discloses a field-emitter device that is the same or substantially the same, this part of the rejection must fall for the same reason. That is, the examiner has not identified any disclosure of a device in which the carbon layer on top of the treated substrate "emits substantially more electrons when subjected to a specified electric field than said carbon film on said untreated substrate." Therefore, because we find that Song does not teach or suggest every limitation of the claimed subject matter, we must reverse the rejection over Song.

Hence, on this record before us, we determine that the examiner has not met his initial burden of providing evidence or technical reasoning, as required, to support a prima facie case. Id. We therefore reverse this rejection.

II. The 35 U.S.C. 103 rejection of claims 4-9, 13, and 20-25 over Song in view of Yoshioka

The examiner has not directed our attention to any teaching in Yoshikawa that remedies the deficiencies of Song.

² Song, at col. 5, ll. 19-38, discloses another embodiment in which the ballast layer is made from a field emissive material having a resistivity within the ballasting range. The examiner has not relied on this passage, and has not identified any teaching in the record suggesting that an emissive carbon film be made with the proper resistivity. This issue could be pursued if either the appellants or the examiner supplements the record with relevant evidence.

Accordingly, we reverse the second rejection as well, and provide the following comments for emphasis.³

The examiner states, at the bottom of page 3 of the answer, that Song differs from appellants' claims in the means of changing substrate morphology, and relies on Yoshioka for etching with acids and patterning. On page 4 of the answer, the examiner refers to column 13 of Yoshioka for a teaching of creating a field emitter using carbon layers by etching with acids and patterning.

Upon our review of column 13 of Yoshioka, we cannot find such a teaching. Furthermore, upon our review of the additional disclosure of Yoshioka, we are unable to find disclosure indicating that the substrate depicted in Figures 11b, 11c, 11d, 11e or Figures 14b, 14c, 14d and 14e, is treated such that its morphology is modified. We refer to Yoshioka at column, 9 lines 31-34. Here, Yoshioka's disclosure indicates that electrodes 1 and 2 of Figure 11(c) - 11(E) are formed according to vacuum deposition, photolithoetching, lifting-off, printing, or the like process. However, we are unable to conclude from this disclosure that the morphology of substrate 4 is modified.

Also, upon our review of the examiner's response to appellants' arguments found on pages 4-6 of the answer, we cannot find where the examiner provides a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic of treating a substrate to modify its morphology necessarily flows from the teachings of

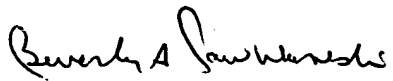
³ We are in complete agreement with the appellants that the examiner has failed to address the limitations of claim 9, 12, and 18 (Brief at 5-6; Reply Brief at 5-6).

Yoshioka. The examiner's comments are completely absent such a basis in fact and/or technical reasoning.

The examiner's reasoning for combining Song in view of Yoshioka is also questionable. That is, the examiner has not explained how to incorporate the teachings of Yoshioka into the process of Song to arrive at appellants' claimed invention. Nor has the examiner explained the motivation for doing so.

REVERSED


Paul Lieberman)
Administrative Patent Judge)


Beverly A. Pawlikowski) BOARD OF PATENT
Administrative Patent Judge) APPEALS AND
INTERFERENCES


Mark Nagumo)
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BAP/cam

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